COSTAGE CARTINE

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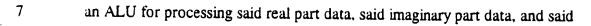
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coefficient data; and

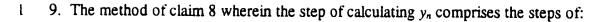
WHAT IS CLAIMED IS:

1	1. A method for improving performance of an audio chip including a DSP, comprising the
2.	steps of:
3	providing an apparatus having a plurality of elements running in parallel with said
4	DSP;
5 .	configuring said apparatus to perform a function according to a configuration setup;
6	and
7 .	employing said apparatus for accessing data from said elements in a pipeline
8	structure to maximize utilization of said elements.
1	2. The method of claim 1 wherein said function is usable in audio algorithms.
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1	3. The method of claim 1 wherein said function is selected from a group consisting of
2	biquad filtering, double precision biquad filtering, IFFT, IDCT, pre-multiplication, and
3	post-multiplication.
l	4. The method of claim 1 wherein said plurality of elements includes:
2	a first memory for storing real part data;
3	a second memory for storing imaginary part data:
4	a third memory for storing coefficient data;

a multiplier for processing said real part data, said imaginary part data, and said

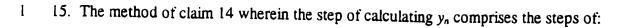


- 8 coefficient data.
- 1 5. The method of claim 1 wherein in a post-multiplication function, data is accessed in bit-
- 2 reverse order.
- 1 6. The method of claim 1 wherein data is accessed in a four-cycle pipeline structure in a
- 2 pre-multiplication function, in an IFFT function, and in a post-multiplication function, data
- 3 is accessed in a six-cycle pipeline structure in a biquad mode, and data is accessed in a
- 4 nine-cycle pipeline structure in a double precision biquad mode.
- 1 7. The method of claim 1 wherein performing a biquad function comprises the steps of:
- receiving N + 1 samples of data x_n for n = m to n = m + N;
- 3 storing data including said samples of data in memory locations in a predefined
- 4 order; and
- calculating y_n according to the equation $y_n = b_0 x_n + b_1 x_{n-1} + b_2 x_{n-2} + a_1 y_{n-1} + a_2 y_{n-2}$.
- 1 8. The method of claim 7 wherein said predefined order comprises: y_{m-2} in a location K.
- 2 y_{m-1} in a location K+1, x_{m-2} in a location K+2, x_{m-1} in a location K+3, and x_m to x_{m+N} in
- 3 location a K + 4 through a location K + N + 4.



- 2 (i) using values of y_{m-2} , y_{m-1} , x_{m-2} , x_{m-1} and x_m in respective locations K, K+1, K
- 3 + 2, K + 3, and K + 4 to calculate a y_m ;
- 4 (ii) storing said y_m in said location K + 2;
- 5 (iii) incrementing m by 1;
- 6 (iv) incrementing K by 1; and
- 7 (v) returning to step (i).
- 1 10. The method of claim 1 wherein performing a double precision biquad function
- 2 comprising the steps of:
- receiving N + 1 samples of data x_n for n = m to n = m + N;
- 4 storing data in memory locations in a predefined order; and
- 5 calculating y_n according to equation $y_n = b_0 x_n + b_1 x_{n-1} + b_2 x_{n-2} + a_1 y l_{n-1} + a_2 y l_{n-2} +$
- $6 \quad a_1yh_{n-1} + a_2yh_{n-2}.$
- 1 11. The method of claim 10 wherein said predefined order comprises: yh_{m-2} in a location
- 2 K, yh_{m-1} in a location K+1, yl_{m-2} in a location K+2, yl_{m-1} in a location K+3, x_{m-2} in a
- location K + 4, x_{m-1} in a location K + 5, and x_m to x_{m+N} in a location K + 6 through a
- 4 location K + N + 6.

- 12. The method of claim 10 wherein the step of calculating y_n comprises the steps of: l
- 2 (i) . using values of yh_{m-2} , yh_{m-1} , yl_{m-2} , yl_{m-1} , x_{m-2} , x_{m-1} and x_m in respective
- locations K, K + 1, K + 2, K + 3, K + 4, K + 5, and K + 6 to calculate a y_m ; 3
- storing a yh_m and a yl_m of said y_m in said locations K+2 and K+44 (ii)
- 5 respectively;
- 6 incrementing m by 1; (iii)
- 7 (iv) incrementing K by 1; and
- 8 (v) returning to step (i).
- 13. A method for performing a biquad function comprising the steps of:
 - receiving N + 1 samples of data x_n for n = m to n = m + N;
 - storing data in memory locations in a predefined order; and
 - calculating y_n according to the equation $y_n = b_0x_n + b_1x_{n-1} + b_2x_{n-2} + a_1y_{n-1} + a_2y_{n-2}$.
 - 14. The method of claim 13 wherein said predefined order comprises: y_{m-2} in a location K.
 - y_{m-1} in a location K+1, x_{m-2} in a location K+2, x_{m-1} in a location K+3, and x_m to x_{m+N} in a
 - 3 location K + 4 through a location K + N + 4.



- 2 (i) using values of y_{m-2} , y_{m-1} , x_{m-2} , x_{m-1} and x_m in respective locations K, K+1,
- 3 K+2, K+3, K+4 to calculate a y_m ;
- 4 (ii) storing said y_m in said location K + 2;
- 5 (iii) incrementing m by 1;
- 6 (iv) incrementing K by 1; and
- 7 (v) returning to step (i).
- 1 16. A method for performing a double precision biquad function comprising the steps of:
- receiving N + 1 samples of data x_n for n = m to n = m + N:
- 3 storing data including said samples of data in memory locations in a predefined
- 4 order; and
- 5 calculating y_n according to the equation $y_n = b_0 x_n + b_1 x_{n-1} + b_2 x_{n-2} + a_1 y l_{n-1} + a_2 y l_{n-2}$
- $6 + a_1 y h_{n-1} + a_2 y h_{n-2}.$
- 1 17. The method of claim 16 wherein said predefined order comprises: yh_{m-2} in a location
- 2 K, yh_{m-1} in a location K+1, yl_{m-2} in a location K+2, yl_{m-1} in a location K+3, x_{m-2} in a
- 3 location K + 4, x_{m-1} in a location K + 5, and x_m to x_{m+N} in a location K + 6 through a
- 4 location K + N + 6.

- 1 18. The method of claim 17 wherein the step of calculating y_n comprises the steps of:
- 2 (i) using values of yh_{m-2} , yh_{m-1} , yl_{m-2} , yl_{m-1} , x_{m-2} , x_{m-1} and x_m in respective
- 3 locations K, K + 1, K + 2, K + 3, K + 4, K + 5, and K + 6 to calculate a y_m ;
- 4 (ii) storing a yh_m and a yl_m of said y_m in said locations K+2 and K+4
- 5 respectively;
- 6 (iii) incrementing m by 1;
- 7 (iv) incrementing K by 1; and
- 8 (v) returning to step (i).